

REMARKS

Responsive to the outstanding Office Action, applicant has carefully studied the Examiner's rejections and the comments relative thereto. Favorable reconsideration of the application is respectfully requested in light of the following detailed arguments.

After amendment, claims 30-39 are pending in this application. In this response, claims 30 and 35-39 have been amended, have been canceled. No new matter has been introduced by these amendments.

REJECTIONS UNDER 35 USC §112 First Paragraph

Claims 30-39 were rejected under 35 USC §112, first paragraph, for failing to comply with the enablement requirement. The Examiner notes that the phrase "operating at quench pressure" fails to establish a sufficient relationship between the glass material and the method of processing steps to be considered enabling for one of ordinary skill.

Claim 30 has been amended in a manner believed to clarify this subject matter. The subject matter is now presented in such a way as to show that the glass is first heated and then subsequently quenched, and the claim then goes on to describe the operating conditions of the quench in relative terms, relative to a standard condition. It is believed that this would provide sufficient information to one skilled in the art to make and use the invention as claimed.

Again, with regard to the applicable standard, the application, as filed, referred to the national standards of the country of the application. Therefore, the applicable ANSI standard, well known to one skilled in the art was inserted. It is further respectfully submitted that the standard includes reference to the date of the standard, which was the applicable US standard as of the time of the filing of the application. It is therefore believed that this subject matter is supported in the application as filed, at the time it was filed.

With regard to the magnesium content being less than 1%, the Examiner notes that the specification, in this one part, refers to magnesium as opposed to magnesium oxide. It is respectfully submitted that one skilled in the art would recognize that this reference is to the compound, as that is consistent with how it is used in the application,

and consistent with the use throughout the specification. It is believed that this is the only reference to "magnesium" as opposed to the compound. The Examiner's attention is drawn to paragraphs spanning pages 6 and 7 of the application. It is clear in these paragraphs that magnesium oxide is used throughout, with the exception of this one reference. In fact, for the bottom limit magnesium is used, but for the top limit magnesium oxide is used each time. It would not follow that magnesium oxide would be used in one of these references but magnesium in the other. It is respectfully submitted that this reference is properly referring to magnesium oxide, and the omission of the term in the specification was merely typographical, and one skilled in the art would realize this fact. It is therefore submitted that the specification does support claim 30 as amended.

Further to this, paragraph 22 of the specification has been amended herein to refer to magnesium oxide and not to magnesium. For the reasons stated above this is correcting a clearly typographical error, and is therefore not new matter. Acceptance of this amendment to the specification is therefore respectfully requested.

It is therefore believed that the claims comply with the requirements of 35 USC §112, first paragraph. It is therefore requested that this rejection be reconsidered and withdrawn.

REJECTIONS UNDER 35 USC §112 Second Paragraph

Claims 30-39 have also been rejected under 35 USC §112, second paragraph, for omitting required structural relationships. The Examiner stated that referring to a relative measure of a physical state imparts no patentable weight.

As stated above, applicant submits that the claims have been restated in a manner believed to clarify the claim. It is respectfully submitted that, when claiming "operating conditions" as done here, that the comparison of proposed operating conditions to a known standard, is definite, in that it is directly comparable to conditions which are known in the art, and would be easily ascertainable to one skilled in the art. The present invention merely defines, in relative terms, the operating conditions for attaining the desired results. This is best done as shown in the present claims, by comparison of the operating conditions to those of known standards.

In view of the above, reconsideration and withdrawal of the present rejections are respectfully requested.

REJECTIONS UNDER 35 USC §103

Claims 30-39 and 44 were rejected under 35 USC §103 as being unpatentable over Littleton in view of Cheng. Claim 44 was previously canceled thereby rendering the rejection thereagainst moot.

Before discussing the applied art in detail, applicants would like to point out features of the present invention, as claimed in independent claim 30. Claim 30 shows an improvement in a method of tempering a glazing comprised of boron-free glass having a magnesium oxide content of less than 1% by weight, a coefficient of thermal expansion greater than 95×10^{-7} per degree Centigrade and a Fracture Toughness of less than $0.72 \text{ MPam}^{1/2}$. The quench is operated at a quench pressure at least 20% less than the quench pressure required to temper a corresponding glazing of standard composition to the standard ANSI Z26.1-1996 under otherwise similar conditions.

Littleton (US 2,311,846) does not show a method of tempering a glazing of boron-free glass having a magnesium oxide content of less than 1% by weight. The only compositions described in Littleton are in Table I at the bottom of page 2. Only example F is boron-free but this includes a "standard" amount of magnesium oxide (3.5 %) — the text immediately following the table indeed states that the glass in example F is a typical soda lime glass, which would be recognized by one skilled in the art as containing a higher concentration of MgO than claimed in the present invention.

The Cheng (WO 01/07356 A1) reference fails to disclose a method of tempering a glazing of boron-free glass having a magnesium oxide content of less than 1% by weight. Cheng addresses glass compositions for infrared and ultraviolet radiation absorbing green glass compositions (page 1, lines 7-8). There is no disclosure of a method of tempering such compositions. Insofar as there is an enabling disclosure of glass compositions in Cheng, on page 9, lines 13-23 and on page 10, lines 24-34 the glass compositions consist essentially of ingredients including about 3 to 4 % by weight of MgO and excluding boron. This concentration of Magnesium oxide is outside the

range claimed in the present invention. Further, the specific compositions of examples 11 and 12 (at the bottom of page 16) and the green glass described on page 17, lines 32-27 are also boron-free and include 4.14 %, 3.97 % and 4.00 % MgO respectively. All of the formulations shown on pages 9 and 10 of Cheng discloses between 1-5% MgO (with the exception of the second formulation which discloses 3-4%).

It is further respectfully submitted that the Examiner indicates that Cheng shows iron, expressed as Fe_2O_3 from about 0.7% to about 1.25%. It is respectfully submitted that this composition refers to the "batch" and not the amount of iron in the glass product, and that this number is not relevant to the glass produced.

The Examiner states that a composition not listing boron is understood to be effectively "boron-free" by omission. This assertion by the Examiner is respectfully averred from. The compositions listed in the specification of Cheng on pages 8 and 9 each use "comprises" or "consists essentially of". Comprises is well determined to be an open ended term – the materials listed must be present, but no exclusion of other materials is made. Consists essentially of is less open ended, but is still not as restrictive as the term "consists of". It is respectfully submitted that none of these examples, using these terms, can reasonably be determined to infer "boron-free" as defined in the present application.

Additionally, the Examiner continues to refer to the earlier claim that the application contains less than 2% by weight MgO, as opposed to the current less than 1%. As argued above with respect to the rejection under 35 USC §112, first paragraph, it is believed that this composition is properly disclosed in the application as filed, and that therefore no composition shown by Cheng discloses the composition of the present invention as claimed herein.

As stated in the response to the last office action, insofar as there is an enabling disclosure of glass compositions in Cheng, on page 9, lines 13-23 and on page 10, lines 24-34 the glass compositions consist essentially of ingredients including about 3 to 4% by weight of MgO and excluding boron. Furthermore the specific compositions of examples 11 and 12 (at the bottom of page 16) and the green glass described on page 17, lines 32-27 are also boron-free and include 4.14%, 3.97% and 4.00% MgO respectively: much greater than the claimed 1 %.

The Examiner compares Composition I in paragraph [0031] to the compositions disclosed in Cheng to support of his contentions. Composition I comprises 71.0% SiO₂, 10.5% CaO, 1.0% Fe₂O₃, 1.11% Al₂O₃, 0.21% MgO, 14.9% Na₂O, 0.64% K₂O, 0.35% TiO₂, 0.17% SO₃ and exhibits 35% ferrous. Cheng includes four “general” compositions on pages 9 and 10, which have been summarized below (the italicized numbers in square brackets representing the number of possible values for each range for the number of decimal places given):

Weight%	1	2	3	4
SiO ₂	65-75 [11]	70-73 [4]	65-75 [11]	70-73 [4]
Na ₂ O	10-15 [6]	12-14 [3]	10-15 [6]	12-14 [3]
K ₂ O	0-4 [5]	0-1 [2]	0-4 [5]	0-1 [2]
MgO	1-5 [5]	3-4 [2]	1-5 [5]	3-4 [2]
CaO	5-15 [11]	6-10 [5]	5-15 [11]	6-10 [5]
Al ₂ O ₃	0-3 [4]	0-2 [3]	0-3 [4]	0-2 [3]
Fe ₂ O ₃	0.51-0.96 [46]	0.51-0.96 [46]	0.5(0.48)-0.9(0.92) [41]	0.5(0.48)-0.9(0.92) [41]
FeO	0.15-0.33 [19]	0.15-0.33 [19]	0.15-0.33 [19]	0.15-0.33 [19]
CeO ₂	0.20-1.40 [121]	0.20-1.40 [121]	0.10-1.36 [127]	0.10-1.36 [127]
TiO ₂	-	-	0.02-0.85 [84]	0.02-0.85 [84]
Total Permutations	7,677,740,4 00	76,142,880	603,333,007,200	5,983,467,840

Only general compositions 3 and 4 of Cheng include titania. However, each of these has a maximum iron content of 0.9 (0.92) % wt, which is significantly lower than the 1.0 % wt defined in Composition 1. Furthermore 0.21% MgO is also significantly lower than the 1% wt of composition 3 and the 3% wt of composition 4.

Regarding the maximum iron content, which was described more concisely above, the Examiner has mistakenly quoted that Fe_2O_3 can be in the range 0.7-1.25% wt. Page 11, lines 10-17 of Cheng explain that 0.7-1.25 % of iron in the **batch** equates to *around 0.51-0.96 %wt of total iron in the glass*. The maximum iron content drops from 0.96 %wt in general compositions 1 and 2 to 0.9 %wt in general compositions 3 and 4. In fact, lines 27-31 on page 9 of Cheng explain that in order to maintain the desired ranges of transmittance, dominant wavelength and color purity when substituting titanium oxide for cerium oxide in the glass, the weight percent of total iron must be reduced. So, the disclosure of Cheng clearly shows that for a titania-containing glass, the maximum iron content is 0.9 %wt.

It is therefore submitted that no comparison to be made between Composition I and any of the glasses disclosed in Cheng, especially as generally described in compositions 1 to 4 summarized above. Furthermore, as shown in the "Total Permutations" row of the table above, there is no way that that one skilled in the art could be motivated to try routine experiment with the ranges given to arrive at a glass anywhere close to Composition I. There are, literally, millions of combinations of ingredients to try, so mere trial-and-error would be effectively impossible. Further, because of the differences between the glasses in Cheng and the glasses in the present application, the properties of coefficient of thermal expansion and fracture toughness cannot be said to be inherent in the Cheng glasses. The present invention lies in the creation of a glass which can be tempered by a method that employs lower quench pressures than would be necessary for a glass of standard composition.

Turning to the Littleton reference, it is respectfully submitted that there is no disclosure in Littleton of a method of tempering a glazing of boron-free glass having a magnesium oxide content of less than 1 % by weight and a coefficient of thermal expansion greater than 95×10^{-7} per degree Centigrade, and which comprises the steps of heating the glass in a furnace and subsequently quenching the glass with air from upper and lower quench nozzles. The only compositions described in Littleton are in Table I at the bottom of page 2. Only example F is boron-free but this includes a "standard" amount of magnesium oxide (3.5 %) and has a coefficient of thermal

expansion of 92×10^{-7} per degree Centigrade: in fact, the text immediately following the table indeed states that the glass in example F is a typical soda lime glass.

It is noted that the Examiner has now made Littleton the primary reference and Cheng the secondary reference. Applicant, in response, questions why one skilled in the art, when looking at the Littleton reference, would look to the Cheng reference. It is respectfully submitted that one skilled in the art would not be motivated to combine the teachings of Cheng and Littleton. The references belong in completely different technical fields and were it not for knowledge of the present invention, there would be no reason to bring these two documents together.

The Examiner states that Cheng reads upon applicants' composition (which is believed to be incorrect, as discussed above) and that it would inherently provide every physical property of the applicants claimed composition.

Applicants also disagree with this contention. The process steps of the present invention define conditions relative to, but different from, the standard quench conditions. It is respectfully submitted that one skilled in the art would NOT expect the properties to be the same when different physical conditions were applied.

Therefore, it is respectfully submitted that no reasonable combination of the applied references yield the present invention as claimed. Further, even if the references did show all of the features as claimed, it is respectfully submitted that one skilled in the art would have no reason to combine these references.

In summary, amended claims 30 to 39 are believed to be non-obvious over both of the applied references Cheng and Littleton and any reasonable combination thereof. In view of the above, reconsideration and withdrawal of the present rejection are respectfully requested.

SUMMARY

For the reasons above, it is submitted that the independent claims are allowable over the applied art of record. The remaining claims are believed to be allowable based, at least, upon their dependence from allowable base claims as shown above.

Should the Examiner wish to modify any of the language of the claims, applicants' attorney suggests a telephone interview in order to expedite the prosecution of the application.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Mark A. Hixon', with a stylized flourish at the end.

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